EXECUTIVE SUMMARY

The protection and enhancement of Lake Okeechobee is being achieved through multi-agency research, monitoring, and management programs. This Surface Water Improvement and Management (SWIM) Plan Update describes these efforts and provides their status and planned future direction. The once natural lake and wetland system now has several roles in the regional system. These include: (1) flood control; (2) agricultural water use; (3) urban and industrial water supply; (4) protection of wetland and estuarine systems and enhancement of fish and wildlife resources; (5) prevention of saltwater intrusion; (6) navigation; (7) recreation; and, (8) water supply for Everglades National Park. The correct balance of these competing needs plays an integral part in the long-term health of Lake Okeechobee and fulfilling the Lake Okeechobee Vision (see inside cover).

In 1987 the Florida Legislature required the South Florida Water Management District (SFWMD) to "design and implement a program to protect the water quality of Lake Okeechobee" (S. 373.4595, Florida Statutes (F.S.), the SWIM Act. The District did design and implement such a program, which includes the Interim SWIM Plan (March, 1989), the SWIM Plan Update (1993), and this current SWIM Plan Update effort.

Another important aspect of the SWIM Act required that the program be designed to result in lowering phosphorus loadings to the lake by an amount specified as excessive (i.e., 40% reduction) in the SFWMD Technical Publication 81-2, by July 1, 1992. High concentrations of nutrients have contributed to the proliferation of algal blooms in Lake Okeechobee, and management and research efforts have been directed toward reducing phosphorus from external and internal sources. Programs that have been implemented to achieve this goal include the Works of the District (WOD) regulatory program, the Florida Department of Environmental Protection (FDEP) Dairy Rule (Chapter 62-670, Florida Administrative Code (F.A.C.)), and the research and monitoring programs coordinated by the SFWMD. Through these programs, the excess phosphorus loading to the lake has been greatly reduced, but has not achieved the full 40% reduction specified in the SWIM Act.

The highest concentrations are found in the Lower Kissimmee basins (S-65D & 65E), the S-154 basin, and the Taylor Creek-Nubbin Slough basins. These basins have most of the dairies as well as the majority of Works of the District sites that are out of compliance. These basins account for most of the over-target phosphorus load, and, if they met their target concentrations, would collectively bring overall loading to Lake Okeechobee under target. These basins currently receive intensive study, regulatory scrutiny, and remediation activities, including the SFWMD/FDEP/dairy industry's efforts to clean up the dairy "hot spots". Modeling has shown that strict regulatory enforcement on the out-of-compliance sites and the dairies achieving their target would result in only a 23 ton reduction (out of approximately 136 tons) in phosphorus loading to the lake. For this reason, a new non-regulatory, landowner-

based initiative to improve water quality has been undertaken. Currently, cost-share funding is begin sought for a number of sites whose owners are willing to work with the SFWMD to gain further load reductions. A major part of this SWIM Plan Update focuses on current and future efforts to reduce phosphorus loading to the lake, and these programs are described in detail.

The second major part of this SWIM Plan Update focuses on protecting the lake's marsh zone from excessive flooding, drought and the proliferation of exotic plants. The marsh zone occupies approximately 25% of the lake surface, and is used by spawning fish, nesting and feeding wading birds, and provides habitat for threatened and endangered species like the snail kite. Although marsh zone biota are normally adapted to extreme conditions of wet and dry, prolonged flooding can have deleterious impacts on plant, fish, bird, and wildlife communities. Research is being conducted to determine the effect of lake stage on these communities in conjunction with a review of the lake regulation schedule (designed for flood protection). The second aspect of the marsh zone concerns exotic plants. At least 14 exotic plant species have been found, and five species have become a major threat to the ecosystem because of their rapid expansion into areas once occupied by native plants. Programs to control some of these plants have been implemented and research is underway to develop optimal control strategies for certain species.

The following provides a summary of major challenges and strategies derived from all of the elements contained within chapters 3 to 8 of the Lake Okeechobee SWIM Plan Update.

Challenge: Phosphorus loading averages 136 tons above the SWIM Act target. Four key basins account for the majority of the phosphorus.

Strategy: Implement voluntary (landowner) initiatives to reduce flows and loadings, including isolated and riverine wetland restoration, dairy "hot spot" remediation, removing tributary phosphorus sediments, and research on improved pasture best management practices. Continue current WOD regulatory program, compliance monitoring, and modeling of potential load reduction scenarios.

Challenge: In-lake sediments contributing to nutrient and turbidity problems continue to be a major concern. Declining water quality at the south end of lake suggests that mud sediments may be increasing in spatial extent; however, data on sediment distribution and nutrient content are more than 10 years old.

Strategy: Conduct detailed mapping and nutrient assessment of sediments, determine the effects of lake stage on sediment resuspension, quantify in-lake nitrogen and phosphorus cycles, model responses to various load reduction scenarios, and develop linkages between the hydrodynamic and water quality models.

Challenge: High water levels may have an adverse affect on plant and animal communities. Data are lacking on the cause and effect relationship that exists between lake stage and community response.

Strategy: Conduct research to quantify lake stage effects on marsh community structure and function, including nutrient cycling and physiology, germination, spatial distribution, and competition between native and exotic plants, and fish and wildlife utilization. Evaluate how changes in plant communities may impact fish, wildlife, and other ecological and societal values of the ecosystem.

Challenge: Internal nutrient inputs may have adverse environmental effects for the lake and the downstream regional ecosystems. Information is lacking on the relationship between nutrients and community response.

Strategy: Quantify the extent to which key biological process are affected by nutrients and predict community response to different management scenarios through modeling. Evaluate how different management scenarios, including those considered in the C&SF Restudy, will impact the nutrient content of water flowing from the lake to the EAA, Everglades Protection Area, and estuaries.

Challenge: Exotic plants, both *Melaleuca* and Torpedo grass, have replaced entire native plants communities, possibly lowering fish and wildlife habitat quality.

Strategy: Continue the *Melaleuca* herbicide control program and implement biological controls. Continue research for optimizing herbicide treatment of Torpedo grass.

Challenge: Create opportunities for public participation in the SWIM Plan Process.

Strategy: Enhanced environmental education efforts, teacher participation, facilitated discussions on problem solving without additional regulation and minimizing economic impacts, and assist local governments with incorporation SWIM considerations into local comprehensive plans.

Challenge: Public access to the lake needs to be increased in order to enhance recreational uses including fishing, boating, and wildlife observation.

Strategy: Support the Lake Okeechobee Scenic Trail development, and continue working with ecotourism groups.

Challenge: Flood control structure maintenance and traditional boat trail access need to be provided, in cooperation with user needs and protection of the native plants.

Strategy: Incorporate user input into the aquatic spray program to control exotic plants and minimize environment impacts to native vegetation.

The following list of priority projects for improving the condition of Lake Okeechobee is a summary of the overall effort needed based on the text in Chapters 1-8. These priority projects are in addition to the current monitoring effort, that provides information on the current condition of the resource, and the regulatory programs, that work with land owners to meet their permitted discharge limitations. Many other activities associated with the lake can be found in the text. These projects also have a great deal of merit, and this summary is not intended to exclude or diminish the importance of these other activities.

Water Quality Improvement from the Lake Okeechobee Watershed:

- Wetland restoration-both riverine systems and re-isolating depressional wetlands
- Removal of tributary sediments that are rich in phosphorus and highly mobile
- Development of Best Management Practices for improved pastures
- Dairy "hot spot" remediation with FDEP
- Model development for phosphorus control strategies

Water Quality Improvement within Lake Okeechobee:

- Determine the current distribution and phosphorus content of lake sediments
- Determine the effects of lake stage on sediment phosphorus efflux
- Determine nutrient dynamics in the marsh zone and food web
- Model hydrodynamics, sediment movements and water quality

Ecological Improvement in Lake Okeechobee:

- Continue Melaleuca eradication efforts and Torpedo grass herbicide optimization
- Examine the effects of lake stage on marsh zone communities and submerged plants
- Quantify ecological trends in the biota and their response to management activities
- Develop a GIS for the ecological database for visualization and analyses